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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/884,675	06/19/2001	Mathew H. Reilly	1662-38200 JMH (P00-3546)	3217
23505	7590	06/30/2004	EXAMINER	
CONLEY ROSE, P.C. P. O. BOX 3267 HOUSTON, TX 77253-3267			HARKNESS, CHARLES A	
			ART UNIT	PAPER NUMBER
			2183	

DATE MAILED: 06/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/884,675

Applicant(s)

REILLY ET AL.

Examiner

Charles A Harkness

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 13-18, 20, 21, 23, 25, 26, 29-31, 33 and 34 is/are rejected.
- 7) ☒ Claim(s) 11-12, 19, 22, 24, 27-28, and 32 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 July 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Papers Submitted

1. It is hereby acknowledged that the following papers have been received and placed of record in the file: Power of Attorney as received on 02/01/02; Declaration as received on 02/21/02; Petition to Correct Inventorship as received on 02/21/02; and Drawing as received on 07/25/02.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
3. The applicant or their representatives are urged to review the specification and submit corrections for all mistakes of a grammatical, clerical, or typographical nature.

Claim Objections

Claims 11 and 27 are objected to because of the following reasons: Claim 11 cites the limitation of "the first exception handler operates speculatively". This limitation is interpreted to mean that the first exception handler is handling an exception from a speculative instruction, meaning that the instruction may not be in the actual program path, and that the exception handler then handles the exception while the instruction is still speculative. Please make the appropriate changes to clarify the meaning of the limitation. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-3, 13-18, 20-21, 23, 25-26, 29-31, and 33-34 are rejected under 35

U.S.C. 102(b) as being anticipated by Adler et al., U.S. Patent Number 5,634,023 (herein referred to as Adler).

5. Referring to claim 1 Adler has taught a processor, comprising:

a first exception handler that receives and handles critical excepted instructions (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is speculative, thus performance critical, the speculative handler sets a semaphore); and

a second exception handler that receives and handles non-critical excepted instructions (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception).

6. Referring to claim 2 Adler has taught wherein the critical excepted instructions comprise exceptions that are performance critical (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is speculative, thus performance critical, the speculative handler sets a semaphore).

7. Referring to claim 3 Adler has taught wherein the non-critical excepted instructions comprise exceptions that are not performance critical (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception).

8. Referring to claim 13 Adler has taught wherein the second exception handler operates non-speculatively (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-

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speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

9. Referring to claim 14 Adler has taught wherein the second exception handler causes non-critical excepted instructions to be resolved only when it is certain that the excepted instruction is in an executing program (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

10. Referring to claim 15 Adler has taught further comprising a plurality of pipelines with multiple stages, and wherein excepted instructions may arise in one or more of the pipeline stages (Adler figure 4 column 1 lines 23-40).

11. Referring to claim 16 Adler has taught wherein excepted instructions arising from said one or more pipeline stages is routed to the first exception handler or second exception handler based on a predetermined criteria (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; these criteria are predetermined).

12. Referring to claim 17 Adler has taught wherein the predetermined performance criteria relates to performance of the processor (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception).

13. Referring to claim 18 Adler has taught an exception handler for a processor that resolves excepted instructions, comprising:

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a speculative exception handler that receives critical excepted instructions and resolves said critical excepted instructions on a speculative basis (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is speculative, thus performance critical, the speculative handler sets a semaphore; the speculative basis is interpreted to mean that it handles speculative instructions in a certain manner; the system then resolves the exception once the speculative instruction is to be committed); and

a non-speculative exception handler that receives non-critical excepted instructions and resolves said non-critical excepted instructions on a non-speculative basis (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception).

14. Referring to claim 20 Adler has taught wherein the non-speculative exception handler delays resolution of said non-critical excepted instructions until it is certain that said non-critical excepted instruction lies in an actual path of an executing program (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

15. Referring to claim 21 Adler has taught a processor, comprising:

at least one pipeline with a plurality of stages (Adler figure 4 column 1 lines 23-40);
an algorithm for detecting non-executable instructions in said at least one pipeline,
wherein said algorithm generates a command that identifies the non-executable instruction and identifies a reason that the non-executable instruction will not execute (Adler abstract, figure 3 and 6, column 6 lines 28-60);

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a speculative exception handler that receives said command for any non-executable instructions that are critical to processor performance (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is speculative, thus performance critical, the speculative handler sets a semaphore; the speculative basis is interpreted to mean that it handles speculative instructions in a certain manner; the system then resolves the exception once the speculative instruction is to be committed); and

a non-speculative exception handler that receives said command for any non-executable instructions that are not critical to processor performance (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception).

16. Referring to claim 23 Adler has taught wherein the non-speculative exception handler delays resolution of said non-critical non-executable instructions until it is certain that a non-critical non-executable instruction lies in an actual path of an executing program (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

17. Referring to claim 25 Adler has taught wherein said non-speculative exception handler includes logic for resolving non-critical non-executable instructions (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

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18. Referring to claim 26 Adler has taught a method of handling exceptions in a processor during the execution of a program, comprising the acts of detecting an exception in one or more stages of one or more pipelines;

identifying if the exception is critical to the performance of the processor (Adler figure 3);

routing critical exceptions to a first exception handler (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is speculative, thus performance critical, the speculative handler sets a semaphore; the speculative basis is interpreted to mean that it handles speculative instructions in a certain manner; the system then resolves the exception once the speculative instruction is to be committed);

routing all non-critical exceptions to a second exception handler (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception); and

expeditiously resolving critical exceptions (Adler abstract, figure 3 and 6, column 6 lines 28-60).

19. Referring to claim 29 Adler has taught wherein a plurality of pipelines are provided for executing multiple program instructions in parallel, and wherein exceptions are detected in each stage of each pipeline (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

20. Referring to claim 30 Adler has taught wherein the second exception handler delays resolution of said non-critical exceptions until it is certain that a non-critical exception lies in an

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actual path of the program (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

21. Referring to claim 31 Adler has taught a method of handling exceptions in a processor during the execution of a program, comprising the acts of:

detecting an exception and identifying if the exception is critical or non-critical to the processor performance (Adler figure 3);

routing critical exceptions to a speculative exception handler (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is speculative, thus performance critical, the speculative handler sets a semaphore; the speculative basis is interpreted to mean that it handles speculative instructions in a certain manner; the system then resolves the exception once the speculative instruction is to be committed); and

routing all non-critical exceptions to a non-speculative exception handler (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception).

22. Referring to claim 33 Adler has taught wherein the non-speculative exception handler delays resolution of said non-critical exceptions until it is certain that a non-critical exception lies in an actual path of the program (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

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23. Referring to claim 34 Adler has taught wherein the exceptions from the non-speculative exception handler are selected for resolution prior to the exceptions from the speculative exception handler (Adler abstract, figure 3 and 6, column 6 lines 28-60; if the exception is non-speculative, thus not performance critical, an error handler handles the specific exception; the error handler only receives instruction exceptions when the code is to be committed).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

24. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adler in view of Le et al., U.S. Patent Number 6,721,874 (herein referred to as Le).

25. Referring to claim 4 Adler has not taught wherein the critical excepted instructions include branch mispredictions. Le has taught wherein the critical excepted instructions include branch mispredictions (Le column 8 lines 23-41). Adler has not given an exclusive list of exceptions that the system checks for. However, one of ordinary skill in the art would recognize that a system would want to check for particular exception to prevent the system from producing incorrect results. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include particular exceptions in the exceptions that the system of Adler checks for to prevent the system from producing incorrect results.

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26. Referring to claim 6 Adler has not taught wherein the critical excepted instructions include jump mispredictions. Le has taught wherein the critical excepted instructions include jump mispredictions (Le column 8 lines 23-41). Adler has not given an exclusive list of exceptions that the system checks for. However, one of ordinary skill in the art would recognize that a system would want to check for particular exception to prevent the system from producing incorrect results. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include particular exceptions in the exceptions that the system of Adler checks for to prevent the system from producing incorrect results.

27. Claims 7, 9, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adler in view of Safford et al., U.S. Patent Number 6,681,322 (herein referred to as Safford).

28. Referring to claim 7 Adler has not taught wherein the non-critical excepted instructions include illegal instructions. Safford has taught wherein the non-critical excepted instructions include illegal instructions (Safford column 1 lines 49-61). Adler has not given an exclusive list of exceptions that the system checks for. However, one of ordinary skill in the art would recognize that a system would want to check for particular exception to prevent the system from producing incorrect results. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include particular exceptions in the exceptions that the system of Adler checks for to prevent the system from producing incorrect results.

29. Referring to claim 9 Adler has not taught wherein the non-critical excepted instructions include invalid instructions. Safford has taught wherein the non-critical excepted instructions include invalid instructions (Safford column 1 lines 49-61). Adler has not given an exclusive list

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of exceptions that the system checks for. However, one of ordinary skill in the art would recognize that a system would want to check for particular exception to prevent the system from producing incorrect results. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include particular exceptions in the exceptions that the system of Adler checks for to prevent the system from producing incorrect results.

30. Referring to claim 10 Adler has not taught wherein the excepted instructions include arithmetic overflows. Safford has taught wherein the excepted instructions include arithmetic overflows (Safford column 1 lines 49-61). Adler has not given an exclusive list of exceptions that the system checks for. However, one of ordinary skill in the art would recognize that a system would want to check for particular exception to prevent the system from producing incorrect results. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include particular exceptions in the exceptions that the system of Adler checks for to prevent the system from producing incorrect results.

31. Claims 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adler in view of Rahman et al., U.S. Patent Number 5,7654,007 (herein referred to as Rahman).

32. Referring to claim 8 Adler has not taught wherein the non-critical excepted instructions include cache parity errors. Rahman has taught wherein the non-critical excepted instructions include cache parity errors (Rahman column 19 lines 52-57). Adler has not given an exclusive list of exceptions that the system checks for. However, one of ordinary skill in the art would recognize that a system would want to check for particular exception to prevent the system from producing incorrect results. Therefore, it would have been obvious to one of ordinary skill in the

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art at the time of the invention to include particular exceptions in the exceptions that the system of Adler checks for to prevent the system from producing incorrect results.

33. Referring to claim 5 Adler has not taught wherein the critical excepted instructions include load/store traps. Rahman has taught wherein the critical excepted instructions include load/store traps (Rahman column 19 lines 52-57). Adler has not given an exclusive list of exceptions that the system checks for. However, one of ordinary skill in the art would recognize that a system would want to check for particular exception to prevent the system from producing incorrect results. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include particular exceptions in the exceptions that the system of Adler checks for to prevent the system from producing incorrect results.

Allowable Subject Matter

34. Claims 11-12, 19, 22, 24, 27-28, and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

35. Referring to claims 11-12, 19, 22, 24, 27-28, and 32, the limitations include the exception handler executing in a speculative manner, where speculative operation is known to by executing even though (an) instruction(s) that cause the critical exception may not be in the an actual program path.

Conclusion

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36. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure as follows. Applicant is reminded that in amending in response to a rejection of claims, the patentable novelty must be clearly shown in view of the state of the art disclosed by the references cited and the objections made. Applicant must also show how the amendments avoid such references and objections. See 37 CFR 1.111(c).

Dehnert, James et al, The Transmeta Code Morphing Software.

Ando, Hideki et al., Unconstrained Speculative Execution with Predicated State

Buffering.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles A Harkness whose telephone number is 703-305-7579. The examiner can normally be reached on 8:00 A.M. – 5:30 P.M. with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on 703-305-9712. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-7239 for regular communications and 703-746-7238 for After Final communications.


Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-7579.

Charles Allen Harkness

Patent Examiner

Art Unit 2183

June 23, 2004


EDDIE CHAN
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